

## CLAIMS

1. A catalyst composition for polymerization of a conjugated diene, comprising:
  - (A) a metallocene-type complex of a rare earth metal compound;
  - (B) aluminoxane; and
  - (C) a combination of two or more organometallic compounds of group I to group III elements in a periodic table.
2. The catalyst composition according to claim 1, wherein the metallocene-type complex is a samarium complex.
3. The catalyst composition according to claim 1, wherein the organometallic compounds of group I to group III elements in a periodic table are organoaluminum compounds.
4. The catalyst composition according to claim 1, wherein the combination of two or more organometallic compounds of group I to group III elements in a periodic table is a combination of one or two or more metal alkyl compounds and one or two or more metal alkyl hydrides.
5. The catalyst composition according to claim 1, wherein the combination of two or more organometallic compounds of group I to

group III elements in a periodic table is a combination of triisobutylaluminum and diisobutylaluminum hydride.

6. The catalyst composition according to any one of claims 1 to 5, further comprising an ionic compound composed of a non-coordinating anion and a cation.

7. A co-catalyst used along with a polymerization catalyst for a conjugated diene containing a metallocene-type complex of a rare earth metal compound, comprising: aluminoxane; and a combination of two or more organometallic compounds of group I to group III elements in a periodic table.

8. A production method for a conjugated diene, comprising polymerizing a conjugated diene in the presence of the catalyst composition according to any one of claims 1 to 6.

9. A polymer which can be obtained by polymerization of a conjugated diene through the method according to claim 8.

10. The polymer according to claim 9, wherein: a cis-1,4-configuration content in microstructure of the polymer is 98.5 mol% or more; a number average molecular weight is 250,000 to 350,000; and a molecular weight distribution  $M_w/M_n$  is 2.00 or

less.

11. A polymer of a conjugated diene, wherein: a cis-1,4-configuration content in microstructure of the polymer is 98.5 mol% or more; a number average molecular weight is 250,000 to 350,000; and a molecular weight distribution  $M_w/M_n$  is 2.00 or less.